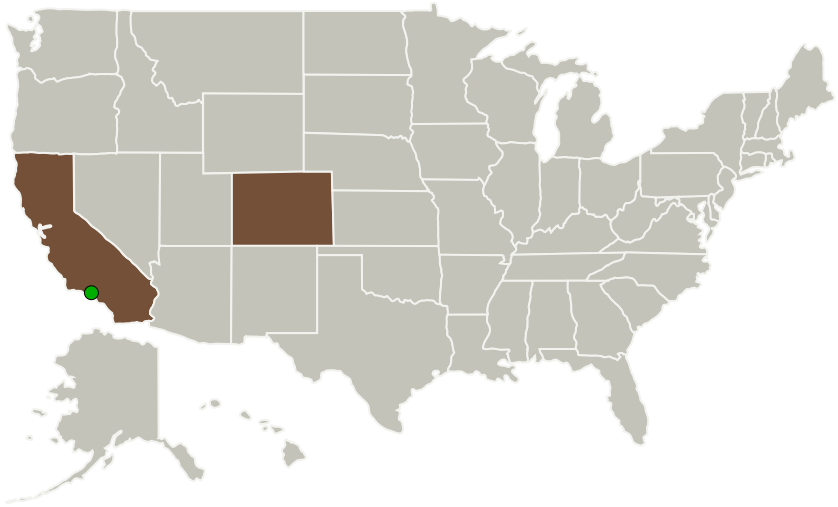
Carbonaceous Asteroid Volatile Recovery (CAVoR) system, Phase II

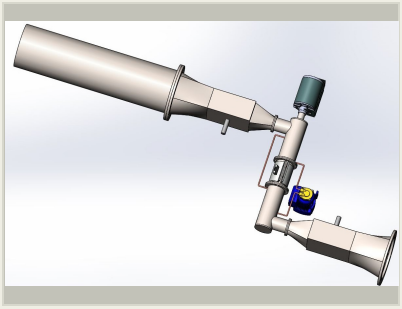
Completed Technology Project (2016 - 2018)

Project Introduction

The Carbonaceous Asteroid Volatile Recovery (CAVoR) system produces water and hydrogen-rich syngas for propellant production, life support consumables, and manufacturing from in-situ resources in support of advanced space exploration. The CAVoR thermally extracts ice and water bound to clay minerals, which is then combined with small amounts of oxygen to gasify organic matter contained in carbonaceous chondrite asteroids. In addition to water, CAVoR produces hydrogen, carbon monoxide, and carbon dioxide that comprise precursors to produce oxygen for propellant and breathing gas and to produce organic compounds including fuels such as methane when integrated with a downstream methanation-electrolysis. Thermochemical production of hydrogen by CAVoR results in substantial reductions in electrolysis mass and power requirements compared to combustion-based volatile recovery methods. A conceptual Phase II continuous flow auger reactor design was based on successful Phase I batch reactor operations. Phase II advancements will include reactor seal designs to accommodate regolith simulant feeding and discharging while collaborations will be developed to aid the infusion of the CAVoR system into a conceptual asteroid resource utilization mission plan.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Pioneer Astronautics	Lead Organization	Industry Historically Underutilized Business Zones (HUBZones)	Lakewood, Colorado
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Colorado

Project Transitions

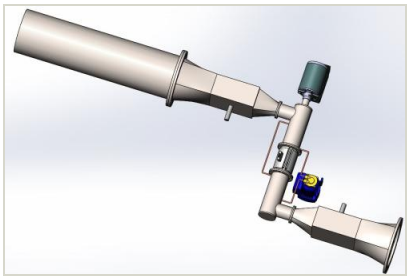
April 2016: Project Start

April 2018: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139786)*

Images



Briefing Chart Image
Carbonaceous Asteroid Volatile Recovery (CAVoR) system, Phase II *(https://techport.nasa.gov/image/126865)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Pioneer Astronautics

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Mark Berggren

Co-Investigator:

Mark Berggren

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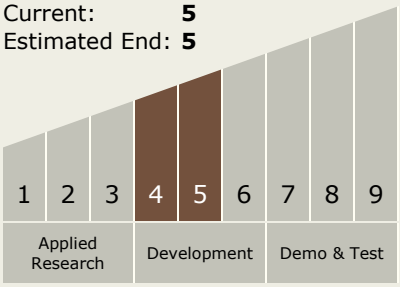
Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.1 In-Situ Resource Utilization
    - TX07.1.3 Resource Processing for Production of Mission Consumables

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System